REMARKS

Claims 1-5 are pending in this application. By this Amendment, claim 1. Support for the amendment can be found at least at page 2, lines 1-5. No new matter is added.

Applicant appreciates the courtesies shown to Applicant's representatives by Examiner Laxton in the December 12, 2007 telephone interview. Applicant's record of the substance of the interview is incorporated into the following remarks.

The Office Action rejects claims 1 and 2 under 35 U.S.C. §103(a) over Kushida et al. (U.S. Application No. 2005/0097701 A1) (Kushida) in view of Hwang (U.S. Patent No. 6,657,417) and rejects claims 3-5 under 35 U.S.C. §103(a) over Kushida in view of Hwang and further in view of Komatsu et al. (EP 1414145 A1) (Komatsu). The rejections are respectfully traversed.

Applicant submits that Kushida fails to disclose or suggest a control device setting an upper limit value of a duty ratio based on an overvoltage that is applied to the power supply when electric power returns back to the power supply resulting from a deviation of the output voltage from the target voltage and providing switching control to the first and the second switching elements using a duty ratio in a range lower than the upper limit value of the duty ratio, as recited in independent claim 1. Kushida fails to consider the overvoltage condition and fails to address how a rapid change in duty ratio may potentially cause an overvoltage at the power supply which is providing an input voltage to the voltage converter.

Kushida discloses that the duty of the pulse signal is based on a pulse width and a maximum counter value TCp1. The maximum counter value TCp1 is set to obtain a period Tp(k). See paragraphs [0074] - [0077]. Further, Kushida discloses adjusting the boost rate of the voltage converting means in accordance to the state of the load in an electric vacuum cleaner in an effort to reduce power loss. See paragraphs [0092] - [0097]. The duty of

Kushida is set to achieve a boost rate to enable the vacuum to maintain its target negative pressure while in an effort to reduce power loss.

From the telephone interview with the Examiner, Applicant understands that the Examiner considers the overvoltage to be disclose by Kushida in paragraphs [0099] and [0111]. Specifically, the Examiner indicated that the V_{in} of Kushida can be read as an overvoltage. Accordingly, Applicant amends independent claim 1 to clarify overvoltage. Applicant submits that Kushida discloses nearly the opposite of the claimed control device setting an upper limit value of a duty ratio based on an overvoltage that is applied to the power supply when electric power returns back to the power supply resulting from a deviation of the output voltage from the target voltage and providing switching control to the first and the second switching elements using a duty ratio in a range lower than an upper limit value of the duty ratio, as recited in independent claim 1. In paragraph [0099], Kushida discloses "next, the maximum output voltage V_{outmax} of the voltage converting means 33 is set (Step S102), and an input voltage V_{in} of the voltage converting means 33 is detected (Step S103). If the input voltage of Vin of the voltage converting means 33 is larger than a lower limit voltage from the result of its detection (Y in step S104), then the data table is retrieved in accordance with the its detected value (Step S105) and a boost rate (duty) and an airflow ranges Q_{dwn} and Q_{up} are set (Step S106)." Kushida here discloses that a maximum output voltage is set, followed by detecting the input voltage. Kushida further discloses that if the input voltage V_{in} is above a lower limit input voltage (V_d), then a boost rate is set. Thus, Kushida is disclosing that the boost rate (duty) is only set if the input voltage is above a minimum value. This is clearly not an overvoltage condition. Overvoltage is well known in the art to relate to a condition that is above the specified operating conditions for a device, and therefore cannot be construed as a lower limit. Still further, paragraph [0099] is relating to figure 11 of Kushida, where it can be seen that if the system of Kushida will only function

if the input voltage V_{in} is above the lower limit V_d and the system will shutoff if below the lower limit (Step S115). This is in direct contrast to the claimed feature in which an upper limit value of the duty ratio is based on an overvoltage that is applied to the power supply when electric power returns back to the power supply resulting from a deviation of the output voltage from the target voltage and the duty ratio is controlled to be in a range below an upper limit value of the duty ratio. Thus, the lower limit of the input voltage cannot possibly be the overvoltage applied to the power supply of independent claim 1.

Paragraph [0111] of Kushida is similar to paragraph [0099] of Kushida. In paragraph [0111], Kushida discloses setting a minimum and maximum current and a maximum output voltage. Kushida continues by disclosing "next, an input voltage V_{in} of the voltage converting means 33 is detected (Step S203). If the input voltage of Vin is greater than a lower limit voltage V_d (Y in step S204), then a boost rate (duty) and current ranges I_{dwn} and I_{up} are set according to the value of the detected voltage v_{in} (Step S206)." As explain above for paragraph [0099], the claimed overvoltage is not the maximum output voltage, the input voltage, or the lower limit voltage V_d of Kushida (See Fig. 11 of Kushida).

In other words, Kushida merely discloses a control structure that changes a boost rate of a voltage converting means 33 according to the state of a load in an electric vacuum cleaner and only when the battery voltage (V_{in}) is above a minimum voltage required to operate the system, and thus effectively operates the voltage converting means to reduce power loss. Kushida neither discloses nor suggests a control structure that provides switching control to a switch 41 using a boost ratio in a range lower than an upper limit value of the boost ratio based on an overvoltage applied to a power supply, as disclosed in the subject application.

Thus, Kushida clearly fails to disclose or suggest when setting an upper limit value of a duty ratio based on an overvoltage that is applied to the power supply when electric power

returns back to the power supply resulting from a deviation of the output voltage from the target voltage, as recited in independent claim 1. Thus claim 1 is patentable over Kushida.

Hwang is merely relied on as allegedly teaching a boost converter that controls two switching elements. Further, although Hwang discloses a boost-type switching power converter 106 corresponding to the "voltage converter," Hwang neither discloses nor suggests a structure in which a controller provides switching control to two switches SW1 and SW2 of boost-type switching power converter 106 using a duty ratio in a range lower than an upper limit value of the duty ratio determined based on an overvoltage applied to a power supply.

Hwang fails to cure the deficiencies of Kushida and therefore, whether taken separately or in combination Hwang and Kushida fail to disclose or suggest the combination of features of independent claim 1. That is, both Kushida and Hwang are silent on the problem that an overvoltage is applied to a power supply when a duty ratio of a voltage converter is considerably changed. Therefore, Kushida and/or Hwang neither disclose nor suggest the concept of determining a duty ratio based on an overvoltage applied to a power supply to be an upper limit value of the duty ratio in order to solve the above problem. Consequently, Kushida and Hwang neither disclose nor suggest the "control device" claimed in claim 1. Thus, claim 1 is patentable over the applied references. Claims 2-5 depend from claim 1, and therefore are patentable over the applied references for at least the same reasons, as well as for the additional features they recite. Withdrawal of the rejections is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of all pending claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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Attachment:
Petition for Extension of Time

Date: January 14, 2008

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